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SAVING BEANS FROM MOSAIC

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U. S. DEPARTMENT OF AGRICULTURE

Importance of Bean Mosaic

Common bean mosaic, which has been known for over 50 years, is world-wide in occurrence. It is not, however, the only mosaic of beans. Since the different mosaics produce similar field symptoms, they are discussed in this leaflet more or less as one disease. Collectively, they are called bean mosaic.

In many bean-growing sections of the United States bean mosaic is widespread in some years. All the plants in a field may be infected. In 1945 half or more of the Pinto beans in nearly all the irrigated fields in northeastern Colorado were affected with mosaic. During the past 3 years mosaic was widespread on many varieties of snap bean in the bean-growing districts of southern Idaho. In 1947 the disease was reported in much of the snap bean acreage of Florida.

Because the disease rarely kills the plants and the symptoms are frequently hard to see, many growers overlook it and underestimate its importance. Mosaic, however, reduces yields considerably. Many of the low yields reported in sections growing snap or dry beans for market, canning, or seed are actually due to mosaic. Furthermore, nubbins and pods deformed or made shiny or mottled by mosaic are rejected or bring lower prices when marketed as green beans than healthy ones do. It is estimated that each year mosaic causes losses totaling several millions of dollars.

Cause of Bean Mosaic

Bean mosaic is caused by a virus. The nature of a virus is not well understood. It is known, however, that a virus can be carried from a diseased plant to a healthy one. This is done most commonly by plant lice. Eventually the virus will make the healthy plant develop symptoms just like those of the plant that was diseased first. The virus may spread throughout the entire plant, sometimes even into the seeds. Although these seeds may look normal, they carry the virus and will produce diseased plants.

Kinds of Bean Mosaic

There are several kinds of bean mosaic, but under field conditions it is hard to tell them

apart. The three important kinds are (1) common bean mosaic, (2) a variant of this mosaic, and (3) yellow bean mosaic. The first two are seed-borne: they affect only beans and their relatives.

Common bean mosaic is the most widespread. The variant strain of common mosaic which was discovered recently in certain sections has symptoms identical with those of common mosaic on some varieties. On certain other varieties it produces shiny pods, a symptom not typical of common mosaic.

Yellow bean mosaic, which is primarily a disease of sweetclover, has distinctly different symptoms from common mosaic. Furthermore, it is not carried in bean seeds. It is spread by plant lice from sweetclover to beans. Yellow bean mosaic may also be found on crimson clover, red clover, and gladiolus. When these crops are infected and grown in close proximity to beans, the disease may spread from them to beans.

Symptoms of Bean Mosaic

Susceptible bean plants may become infected by the bean mosaic virus at any time during the growing season. Symptoms are not evident on the stems or the seeds.

Leaf mottling of some sort is always evident on plants affected with mosaic. The pattern made by the mottled yellow and green areas may vary. Some leaves are slightly mottled, whereas others are almost completely yellow. Frequently dark-green areas develop near the veins and veinlets of infected leaves. In addition, leaves of very susceptible varieties may be considerably puckered and may develop areas that look like warts or blisters. Malformation of leaves is common. On less susceptible varieties the leaves are ruffled, crinkled, or cupped downward; such symptoms may be followed by general yellowing and slight bronzing, and the veins may be very distinct. In some cases the pods are mottled, undersized, deformed, and rough and have a very shiny appearance.

Plants that are infected early are often dwarfed and spindling. They may produce few flowers and pods. Consequently the yield is decidedly reduced.

Detection of Bean Mosaic

Sometimes the symptoms of mosaic can be detected on the bean leaves that are formed first. However, the mottling on them is usually so mild that it is easily overlooked. After the plant forms its three-leaflet leaves, the symptoms can be seen most easily.

Mosaic is hard to find under certain weather conditions, but weather has little effect on its presence. Low temperatures mask symptoms of mosaic, whereas reasonably high temperatures favor their appearance.

Transmission of Bean Mosaic

All bean mosaics except yellow mosaic can be established in the field by planting infected seeds. Plant lice carry mosaic from bean plant to bean plant by feeding first on diseased plants and then on healthy ones. They may thus cause infection of a high percentage of plants in a field. Symptoms develop about 10 days after feeding.

Usually yellow bean mosaic is established in a beanfield by plant lice that have fed on infected sweetclover, crimson clover, red clover, and gladiolus plants. Lice that feed on infected bean plants also can carry the mosaic to other plants.

Cultivation, roguing, and picking do not spread mosaics from infected bean plants to healthy ones.

Control of Bean Mosaic

Use of resistant varieties.—Planting mosaic-resistant varieties of beans is the only satisfactory way of preventing mosaic. Varieties that will resist all the bean viruses, however, have not yet been developed.

The varieties of snap bean resistant to common bean mosaic are Idaho Refugee, U. S.[1] No. 5 Refugee, Sensation Refugee, Medal Refugee, Logan, Rival, Florida Belle, Golden Gate Wax, and Ranger. These can be procured from most of the large seed companies dealing in beans.

The varieties of dry beans resistant to common bean mosaic fall into several classes. The re-

[1] The initials "U. S." refer to a production of U. S. Department of Agriculture.

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sistant varieties of pea beans are Robust and Michelite. Some of the best resistant strains of Great Northern are U. I.[2] No. 15, U. I. No. 59, U. I. No. 81, U. I. No. 123, and Montana No. 1. There are also two resistant strains of Red Mexican, namely U. I. No. 3 and U. I. No. 34. Very recently three mosaic-resistant strains of Pinto have been released. These are U. I. No. 72, U. I. No. 78, and U. I. No. 111.

Many of the varieties that are resistant to the common mosaic virus are tolerant to the variant strain of it.

The varieties of dry bean resistant to the variant strain of common bean mosaic are U. I. No. 59, U. I. No. 81, and U. I. No. 123 strains of Great Northern and Red Mexican U. I. No. 3 and U. I. No. 34.

The resistant varieties of dry beans can be purchased from dry-bean seed dealers.

No variety resistant to yellow bean mosaic has been developed thus far.

Roguing.—Roguing the diseased plants from the field is sometimes a practical method of control, but it is a temporary measure. This method should not be undertaken, however, if a great number of the plants are infected. It has been found practical in some sections where the crop is being grown for seed stock and the acreage to be rogued is relatively small. Seed from rogued fields generally produces higher yielding crops than seed from nonrogued infected fields.

Sanitation.—In sections where yellow bean mosaic is prevalent it is a good practice to keep sweetclover, crimson clover, red clover, and gladiolus plants some distance away from the beanfields. Keep fence rows and ditchbanks free of sweetclover. This will remove a common source of yellow bean mosaic from which plant lice carry the virus to beans.

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[2] The initials "U. I." indicate that the strain was originated by the University of Idaho.

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